

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 867 323 A3

(12)

## EUROPEAN PATENT APPLICATION

(88) Date of publication A3:  
06.10.1999 Bulletin 1999/40

(51) Int. Cl.<sup>6</sup>: B60K 6/04, B60L 11/12  
// B60K41/00

(43) Date of publication A2:  
30.09.1998 Bulletin 1998/40

(21) Application number: 98105008.1

(22) Date of filing: 19.03.1998

(84) Designated Contracting States:  
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC  
NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(30) Priority: 24.03.1997 JP 9026897  
13.10.1997 JP 29624697

(71) Applicant:  
TOYOTA JIDOSHA KABUSHIKI KAISHA  
Aichi-ken 471-8571 (JP)

(72) Inventors:  
• Takaoka, Toshifumi  
Toyota-shi, Aichi-ken 471 (JP)  
• Nishigaki, Takahiro  
Toyota-shi, Aichi-ken 471 (JP)  
• Kojima, Masakiyo  
Toyota-shi, Aichi-ken 471 (JP)

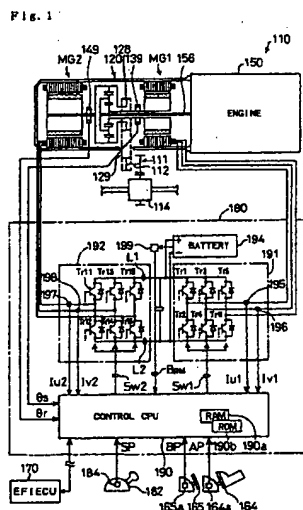
• Kanai, Hiroshi  
Toyota-shi, Aichi-ken 471 (JP)  
• Nagase, Kenichi  
Toyota-shi, Aichi-ken 471 (JP)  
• Abe, Shinichi  
Toyota-shi, Aichi-ken 471 (JP)  
• Kobayashi, Yukio  
Toyota-shi, Aichi-ken 471 (JP)  
• Yamaguchi, Katsuhiko  
Toyota-shi, Aichi-ken 471 (JP)  
• Harada, Osamu  
Toyota-shi, Aichi-ken 471 (JP)

(74) Representative:  
Winter, Brandl, Fűrnis, Hübner, Röss,  
Kaiser, Polte, Kindermann  
Partnerschaft  
Patent- und Rechtsanwaltskanzlei  
Patentanwälte, Rechtsanwalt  
Alois-Steinecker-Strasse 22  
85354 Freising (DE)

## (54) Energy flow management in hybrid vehicle power output apparatus

(57) The present invention prevents a decrease in efficiency due to energy circulation in a power transmission path in a power output apparatus having an engine and a motor as power source. In the power output apparatus, a planetary gear 120 has a sun gear shaft linked with a generator MG1, a ring gear shaft linked with a motor MG2, and a planetary carrier linked with an output shaft of an engine 150. The power output apparatus carries out a control procedure to avoid energy circulation, which goes through the planetary gear 120, the motor MG2, and generator MG1, and the planetary gear 120, and thereby prevent a decrease in efficiency. The energy circulation occurs when the motor MG2 converts the power output from the engine 150 to electric power and the generator MG1 carries out power operation with the regenerated electric power. The control procedure monitors a torque command value of the motor MG2 and shifts a driving point of the engine 150 to another driving point of higher revolving speed when the torque command value is not greater than a threshold value

Tref.



EP 0 867 323 A3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 98 10 5008

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 743 208 A (TOYOTA MOTOR CO LTD) 20 November 1996 (1996-11-20) * claim 2; figure 5 *	1,9,10, 13,19-21	B60K6/04 B60L11/12 //B60K41/00
X	EP 0 743 209 A (TOYOTA MOTOR CO LTD) 20 November 1996 (1996-11-20) * claim 1; figure 5 *	1,9,10, 13,19-21 2,17	
A	DE 196 32 855 A (AISIN AW CO) 20 February 1997 (1997-02-20) * claims; figure 8 *	1,9,18	
X	EP 0 698 520 A (HONDA MOTOR CO LTD) 28 February 1996 (1996-02-28) * claim 1 *	1,9,10, 13,19-21 5-9	
X	EP 0 725 474 A (NIPPON DENSO CO) 7 August 1996 (1996-08-07) * claims 1,18; figures 1,2,8 *	1,9,10, 13,18-21	
X	EP 0 743 215 A (TOYOTA MOTOR CO LTD) 20 November 1996 (1996-11-20) * claims 1-3; figures 5,6,10 *	1,9,10, 13,19-21	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US 4 335 429 A (KAWAKATSU SHIRO) 15 June 1982 (1982-06-15) * claim 1 *	1,9,10, 13,19-21	B60K B60L H02K
A	EP 0 724 979 A (EQUOS RESEARCH KK) 7 August 1996 (1996-08-07) * column 5, line 7 - line 38; claims 1,3 *	1,9,10, 13,18-21	
P,X	WO 97 18101 A (KAWABATA YASUTOMO ;TOYOTA MOTOR CO LTD (JP); NII YOSHIHIDE (JP); Y) 22 May 1997 (1997-05-22) * claims 1,5,7 *	1,9,10, 13,18-21	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 August 1999	Examiner Bufacchi, B
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P4/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 10 5008

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-08-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0743208 A	20-11-1996	JP 9046965 A	14-02-1997
		JP 9046966 A	14-02-1997
		JP 9046967 A	14-02-1997
		JP 9042122 A	10-02-1997
		JP 9047092 A	14-02-1997
		JP 9047093 A	14-02-1997
		JP 9047094 A	14-02-1997
		JP 9047095 A	14-02-1997
		JP 9047096 A	14-02-1997
		JP 9047011 A	14-02-1997
		CA 2195434 A	21-11-1996
		EP 0743209 A	20-11-1996
		EP 0743210 A	20-11-1996
		EP 0743211 A	20-11-1996
		EP 0743212 A	20-11-1996
		EP 0743213 A	20-11-1996
		EP 0743214 A	20-11-1996
		EP 0743215 A	20-11-1996
		EP 0743216 A	20-11-1996
		EP 0743217 A	20-11-1996
		EP 0775607 A	28-05-1997
		WO 9636507 A	21-11-1996
		JP 9175203 A	08-07-1997
		US 5789877 A	04-08-1998
		US 5909094 A	01-06-1999
		US 5920160 A	06-07-1999
		US 5905346 A	18-05-1999
		US 5903112 A	11-05-1999
		US 5903113 A	11-05-1999
		US 5873801 A	23-02-1999
		US 5804934 A	08-09-1998
EP 0743209 A	20-11-1996	JP 9046965 A	14-02-1997
		JP 9046966 A	14-02-1997
		JP 9046967 A	14-02-1997
		JP 9042122 A	10-02-1997
		JP 9047092 A	14-02-1997
		JP 9047093 A	14-02-1997
		JP 9047094 A	14-02-1997
		JP 9047095 A	14-02-1997
		JP 9047096 A	14-02-1997
		JP 9047011 A	14-02-1997
		CA 2195434 A	21-11-1996
		EP 0743208 A	20-11-1996
		EP 0743210 A	20-11-1996
		EP 0743211 A	20-11-1996

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 10 5008

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-08-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0743209 A		EP 0743212 A	20-11-1996
		EP 0743213 A	20-11-1996
		EP 0743214 A	20-11-1996
		EP 0743215 A	20-11-1996
		EP 0743216 A	20-11-1996
		EP 0743217 A	20-11-1996
		EP 0775607 A	28-05-1997
		WO 9636507 A	21-11-1996
		JP 9175203 A	08-07-1997
		US 5789877 A	04-08-1998
		US 5909094 A	01-06-1999
		US 5920160 A	06-07-1999
		US 5905346 A	18-05-1999
		US 5903112 A	11-05-1999
		US 5903113 A	11-05-1999
		US 5873801 A	23-02-1999
		US 5804934 A	08-09-1998
DE 19632855 A	20-02-1997	JP 9058301 A	04-03-1997
		US 5903061 A	11-05-1999
EP 0698520 A	28-02-1996	JP 2738819 B	08-04-1998
		JP 8061106 A	05-03-1996
		US 5608308 A	04-03-1997
EP 0725474 A	07-08-1996	JP 8340663 A	24-12-1996
		JP 9056010 A	25-02-1997
		US 5744895 A	28-04-1998
		US 5917248 A	29-06-1999
		CN 1141859 A	05-02-1997
		JP 9056126 A	25-02-1997
EP 0743215 A	20-11-1996	JP 9046965 A	14-02-1997
		JP 9046966 A	14-02-1997
		JP 9046967 A	14-02-1997
		JP 9042122 A	10-02-1997
		JP 9047092 A	14-02-1997
		JP 9047093 A	14-02-1997
		JP 9047094 A	14-02-1997
		JP 9047095 A	14-02-1997
		JP 9047096 A	14-02-1997
		JP 9047011 A	14-02-1997
		CA 2195434 A	21-11-1996
		EP 0743208 A	20-11-1996
		EP 0743209 A	20-11-1996
		EP 0743210 A	20-11-1996

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 10 5008

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-08-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0743215 A		EP 0743211 A	20-11-1996
		EP 0743212 A	20-11-1996
		EP 0743213 A	20-11-1996
		EP 0743214 A	20-11-1996
		EP 0743216 A	20-11-1996
		EP 0743217 A	20-11-1996
		EP 0775607 A	28-05-1997
		WO 9636507 A	21-11-1996
		JP 9175203 A	08-07-1997
		US 5789877 A	04-08-1998
		US 5909094 A	01-06-1999
		US 5920160 A	06-07-1999
		US 5905346 A	18-05-1999
		US 5903112 A	11-05-1999
		US 5903113 A	11-05-1999
		US 5873801 A	23-02-1999
		US 5804934 A	08-09-1998
US 4335429 A	15-06-1982	JP 1388706 C	14-07-1987
		JP 55127221 A	01-10-1980
		JP 61057204 B	05-12-1986
EP 0724979 A	07-08-1996	JP 2796698 B	10-09-1998
		JP 8207601 A	13-08-1996
		US 5899286 A	04-05-1999
WO 9718101 A	22-05-1997	JP 9201005 A	31-07-1997
		CN 1202135 A	16-12-1998
		EP 0861163 A	02-09-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82